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ORIGINAL

COMPLETED

FLOOD INSURANCE STUDY

TOWN OF OROVILLE, WASHINGTON
OKANOGAN COUNTY

NOVEMBER 1982

Federal Emergency Management Agency

COMMUNITY NUMBER - 530121

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Flood Profiles

Okanogan River Panel 01P

Flood Boundary and Floodway Map Panel 530121 0001

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Panel 530121 0001C

FLOOD INSURANCE STUDY
TOWN OF OROVILLE, WASHINGTON

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Oroville, Okanogan County, Washington, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Town of Oroville to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some States or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at Section 60.1(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by CH_2M Hill, Inc., under Contract No. H-3815 for FIA. This study was completed in July 1976. Additional analysis for this study was performed by the Seattle District COE, and reflects the Local Flood Protection Project in Oroville.

1.3 Coordination

Streams requiring detailed study were identified at a meeting attended by representatives of the study contractor, FIA, and representatives of the Town of Oroville. Results of the hydrologic analyses were coordinated with the U.S. Army Corps of Engineers (COE); the National Weather Service and National Ocean Survey of the National Oceanic and Atmospheric Administration; the U.S. Geological Survey (USGS); the Planning and Community Affairs Agency, the Research Council, the Department of Commerce and Economic

Development, and the Office of Community Development of the State of Washington; the Okanogan Planning Department; the county engineer; the Okanogan County Public Utilities District; the Oroville town clerk and the town superintendent.

Newspaper Companies contacted which provided historic data are: the Seattle Times, Seattle Post-Intelligencer, the Spokesman-Review, and Wenatchee World.

As well as making these individual contacts, an open meeting was held in the Town of Okanogan on June 30, 1975. Arrangements for the meeting were made by the Community Coordination Officer appointed by the Federal Emergency Management Agency. The meeting was held to familiarize government agencies and the public with all aspects of the study, to solicit pertinent information on the study area, and to answer any questions raised. On May 4, 1976, the preliminary draft by CH_2M Hill, Inc., was reviewed at a final Consultation and Coordination (CCO) Meeting attended by personnel of CH_2M Hill, Inc., FIA, and the Town of Oroville. The community's comments at that meeting have been incorporated into this report.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Oroville. The area of study is shown on the Vicinity Map (Figure 1).

Oroville's corporate limits are defined primarily by natural river boundaries. The Similkameen River and Okanogan River form the west and east corporate limits, respectively. Areas studied in detail were the portions of the Similkameen River and Okanogan River affecting the incorporated town.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through July, 1981.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by FEMA and the Town of Oroville.

2.2 Community Description

The Town of Oroville, located in the northeastern region of Okanogan County, is situated at the confluence of the Similkameen and Okanogan Rivers, in north-central Washington State. The study area, completely surrounded by unincorporated areas of Okanogan County, is about five miles south of the U.S.-Canadian border.

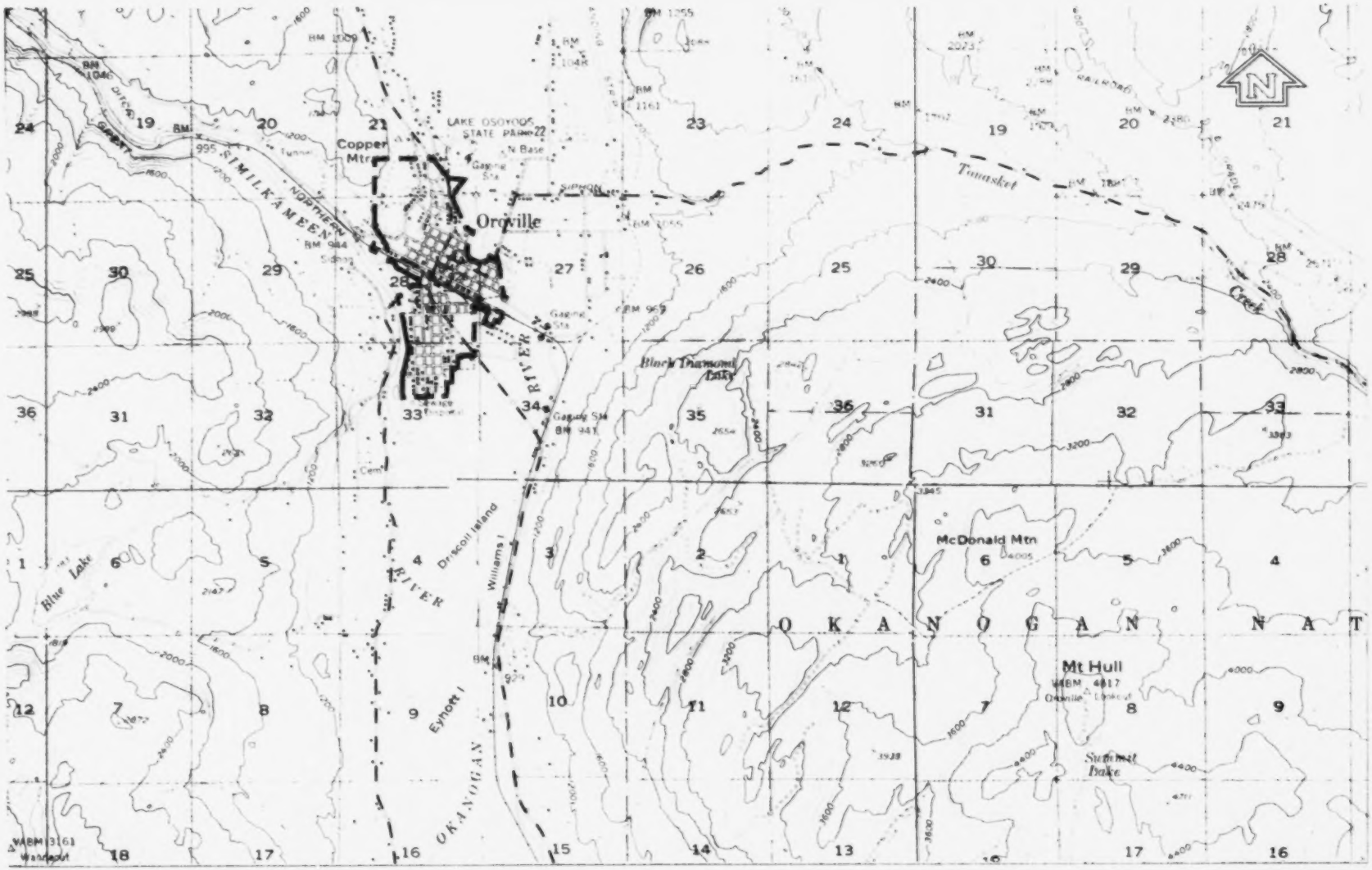

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF OROVILLE, WA

(OKANOGAN CO.)

APPROXIMATE SCALE

0 1 2 3 4 MILES

VICINITY MAP

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Oroville was first settled in 1873 by a rancher named Alexander McCauley. The Oro Town and Improvement Company platted the area in June 1892. Oroville was incorporated in the early 1900's, growing to a population of 495 persons by 1910.

Oroville's highest growth rate occurred from 1910 to 1920, with population increasing almost 105 percent, to 1,013 persons by 1920. The population continued to increase at a decreasing rate until 1950. From 1950 to 1960, the town's population dropped 4.2 percent, from 1,500 persons in 1950 to 1,437 persons in 1960. By April 1975, Oroville's population was up to 1,555 persons (Reference 1).

Oroville has three distinct residential communities. One is located in an area south of the railroad line. Development in this area is somewhat scattered. A second area is in the northeast part of town, extending to the Okanogan River. This is the most highly developed residential area in town. The third community is located in and beyond the northwest part of town. This is the least developed of the areas, especially on the hillside farther from town. However, this area's potential for future development is high, particularly on the hillside view property.

Oroville's central business district extends for three blocks north of the railroad line, along Highway 97. However, some business developments are also scattered south of the railroad line. The tourist-related trades are located along Highway 97, north of town. Lake Osoyoos State Park is situated in this area, on the south shore of the lake.

Oroville's economic base relies heavily on agriculture. Not only is the town surrounded with agricultural land, but the town itself has a fruitpacking industry and is a major clearinghouse for fruit shipments.

Oroville's industrial areas are found east and west of town along the railroad line, and south of town between Highway 97 and Okanogan River. Industrial development includes two major lumber mills east of town.

Oroville serves as the primary trading center for the northern part of Okanogan County. It is also the main port of entry from Canada for north-central Washington State.

Oroville is situated between the Similkameen and Okanogan Rivers. The terrain is generally level, except in the northwestern part of town. This land northwest of town is flat and well-developed close to town but becomes increasingly hilly farther away from town.

Fifty-two percent of the land around Oroville is devoted to agriculture. Urban development accounts for 20 percent of the land use, with the two lumber mills east of town accounting for about 40

percent of this urban development. The remaining 28 percent of the area is presently vacant. Some of this vacant land is expected to be used for future industrial needs.

Apple orchards and alfalfa fields have developed along the rivers and around town. Apple orchards are also found on the hillside northwest of town. Vegetation on the higher land farther away from Oroville is sparse to nonexistent.

Potential sources of floodwater in the town are the Smilkameen River and the Okanogan River. The Similkameen River originates in southern British Columbia, Canada. River discharge is controlled by the Similkameen Dam near Oroville, Washington. The watershed comprises a total of 3,560 square miles, with all but 10 square miles being upstream of the dam (Reference 2). The lowest elevation in its watershed is 905 feet NGVD 1929, found at the river's confluence with the Okanogan River. The watershed climbs to a maximum elevation of 8,507 feet NGVD 1929 at Snowy Mountain in British Columbia. The Similkameen River joins the Okanogan River just south of Oroville.

The Okanogan River originates at Okanogan Lake, north of Penticton, in British Columbia, Canada. The river's watershed encompasses an 8,340 square mile area, of which approximately 3,300 square miles are upstream of Oroville (Reference 2). The watershed ascends from a low elevation of 760 feet National Geodetic Vertical Datum of 1929 (NGVD 1929) at the mouth of the river to an altitude of 8,242 feet NGVD 1929 at Tiffany Mountain, above the north fork of Salmon Creek in Okanogan County. The Okanogan River flows in a southerly direction to join the Columbia River about 74 river miles south of town.

Oroville experiences definite seasonal weather patterns. The summers are hot and dry, and the winters are cold and snowy. The mean high temperature is 72°F in July, and the mean low is 30°F in January. Temperatures have been known to climb as high as 103°F and to drop as low as -17°F. Annual precipitation averages 12.38 inches, the heaviest month being December. Most of the snow falls from November to March, averaging 25.0 inches annually. The heaviest annual snowfall recorded to date is 55.6 inches (Reference 3).

The flood plain around Oroville has been developed extensively. A high percentage of this flood plain is used for orchards and alfalfa fields. However, it also includes part of the central business district, other commercial and industrial establishments, and some residential development.

2.3 Principal Flood Problems

The Similkameen and Okanogan River basins have experienced severe flood conditions in the past, the two most recent occurring in 1948 and 1972. The 1972 flood condition was created by a severe winter that resulted in a snowpack of 150 percent to 175 percent above normal and a subsequent mild spring that caused a sudden thaw of that snowpack. Heavy rains in the spring also contributed to the problem.

This flood was the most severe of several Pacific Northwest floods in 1972. The river crested twice, the first time at a stage of 22.54 feet, which was 0.8 foot over the 1948 level, and the second time at a stage of 21.70 feet, equal to the 1948 level. The peak discharge near Tonasket was 45,200 cfs, representing a 70-year recurrence frequency. The situation was serious enough that the Okanogan Basin was classified as a Category A flood situation, defined as a major flood in a large drainage area in which extensive property damage or serious danger to life or flood protective work prevails or is imminent. The Governor of the State of Washington declared the Okanogan Valley a disaster area on May 31, 1972. By June 10, 1972 the President of the United States declared the valley a Federal disaster area, making it eligible for Federal assistance to aid the region's recovery.

Extensive efforts were made to protect the Okanogan River Valley before and during the flood. Federal, state, county, and local agencies, along with a multitude of individuals, joined forces in an effort to minimize damage. Despite the exhaustive effort to protect Oroville and other endangered communities in the river basin, damage was substantial. Levees and dikes at Okanogan and Riverside toppled, resulting in the flooding of homes and farmland. The Okanogan sewage treatment plant flooded, creating a serious health hazard. Several city blocks in Omak, Okanogan, and Tonasket flooded, as did lands between Tonasket and Oroville. U.S. Highway 97 flooded in four places between Okanogan and Omak, south of Tonasket and in two places between Tonasket and Oroville. The railroad tracks flooded in three places between Riverside and Oroville. Most levees that remained standing became soft and saturated, resulting in considerable seepage. Three hundred residents were evacuated, and at least one person drowned during the flood.

Okanogan flood waters inundated about 300 homes, 200 farm buildings, 5,000 fruit trees, and 50 commercial and public buildings. The COE's effort prevented $2,500,000 in damages, at a cost of $750,000. However, an additional $9,100,000 of damage was actually sustained in the river basin as a direct result of this single flood (Reference 4).

2.4 Flood Protection Measures

A COE built and certified levee between 12th Avenue and U.S. Highway 97 along the Smilkameen River is the only flood protection structure in the town. The levee, completed in early 1981, provides protection for events as large as the 100-year flood. The placement of fill material for a distance of approximately 2,100 feet along U.S. Highway 97 is required to provide the full 3 feet of freeboard.

With the required freeboard the levee will contain the 100-year effects from the Smilkameen River and a recurrence of the June, 1972 flood (Figure 2) would be less likely.

A comprehensive plan for the Town of Oroville was completed in 1964 (Reference 5). The comprehensive plan did not specifically address the question of flood protection measures. It did call for residential areas to be developed on the hillside northwest of town. Homes built in this area would be safe from flood conditions because of their elevation and distance from the river. According to the plan, agricultural and industrial areas would develop in the town's periphery, and thus could be susceptible to flooding.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, or being equalled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (4 in 10), and for any 90-year period, the risk increases to about 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

FIGURE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY **TOWN OF OROVILLE, WA** (OKANOGAN CO.)	**SIMILKAMEEN RIVER AND OKANOGAN RIVER** **JUNE 1972 FLOOD PHOTO**

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For the Okanogan River, flood flow frequency data were based on a statistical analysis of discharge records at the gaging station in Oroville, operated by the USGS since 1943 (Reference 6). The analysis followed the standard log-Pearson Type III (Reference 7). Independent analyses were performed by CH_2M Hill engineers and USGS (Reference 8). Both analyses compared within ±10 percent for the 100-year flood frequency. Peak discharges were also computed using regional rainfall-runoff relationships developed by USGS (Reference 9). The results compared favorably with those derived from the log-Pearson Type III analysis.

Flood flow frequency curves were developed for the Similkameen River in the same manner as for the Okanogan River. Data from a gaging station operated near Nighthawk since 1909 was used for the Similkameen River analysis (Reference 10). Independent log-Pearson Type III analyses done by CH_2M Hill engineers and USGS compared within ±7 percent for the 100-year flood frequency (Reference 8). Corresponding figures reported by the COE were about 10 percent higher than others (Reference 11). Results of the three independent log-Pearson Type III analyses compared favorably with the regional rainfall-runoff analyses. Flood flows for the Similkameen River were not adjusted according to location, since the drainage area varied only one percent from Nighthawk to Oroville.

For the Similkameen and Okanogan Rivers, log-Pearson Type III analyses with zero skew factors were adopted for this study.

A summary of drainage area-peak discharge relationships for each stream studied in detail is shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (Sq. Miles)	PEAK DISCHARGES (cfs)			
		10-Year	50-Year	100-Year	500-Year
SIMILKAMEEN RIVER at Nighthawk	3,590	28,100	39,000	44,100	56,000
OKANOGAN RIVER at Oroville	3,210	3,100	4,600	5,200	6,800

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these flood sources.

Water-surface elevations were computed through use of the COE HEC-2 step-backwater computer program (References 12, 13 and 14).

Cross-sections for the backwater analyses of the Okanogan River were field surveyed. A number of these cross-sections had been surveyed by the COE prior to this study (Reference 11). These cross-sections were verified, and additional required cross-sections were field surveyed. Cross-sections were located to best approximate the shape of the flood channels and at close intervals above and below bridges in order to compute the significant backwater effects of these structures. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles.

Channel and overbank roughness factors (Manning's "n") for these computations were assigned on the basis of field inspection of flood plain areas. Roughness factors for those cross sections previously surveyed were determined by the COE (Reference 11). To achieve maximum accuracy for the analyses, the roughness factors were modified slightly so that the resulting water-surface profile of a backwater analysis matched reported high-water marks associated with known flows along the Okanogan River (Reference 11).

The Okanogan River channel was assigned an "n" value of 0.035 with overbank area values ranging from 0.045 to 0.055.

Aerial photos (Reference 11) and eyewitness accounts of historic floods were used to further verify the accuracy of the backwater analyses.

Flood profiles were drawn based on water-surface elevations computed for the cross-sections. Elevations were computed to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Since the 100-year flood is contained by levee on the Smilkameen River the area on the river side was designated as approximate.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Locations of the elevation reference marks used in this study are shown on the maps.

The hydraulic analyses for this study are based only on the effects of unobstructed flow. Therefore, the flood elevations, as shown on the profiles, are considered valid only if hydraulic structures remain unobstructed.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps, at a scale of 1:1,200 with a contour interval of two feet (Reference 11).

In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

Flood boundaries for the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map(s). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increase the flood heights, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights. Minimum standards of the FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

Since the Similkameen River and the Okanogan River form the natural boundary between Oroville and the surrounding county, a portion of the floodway for these rivers are outside the corporate limits.

The floodways for these studies are typically computed on the basis of equal conveyance reduction from each side of the flood plain. However, for the Okanogan River, permission was granted by FEMA to

locate the floodway coincidental with a levee alignment developed by the Seattle District, COE. The results of backwater analyses of the floodways have been tabulated for selected cross-sections of each stream studied in detail (Table 2). The floodway along the Smilkameen River is contained by levee.

As shown on the Flood Boundary and Floodway Map, the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood are either close together or coincide, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 3.

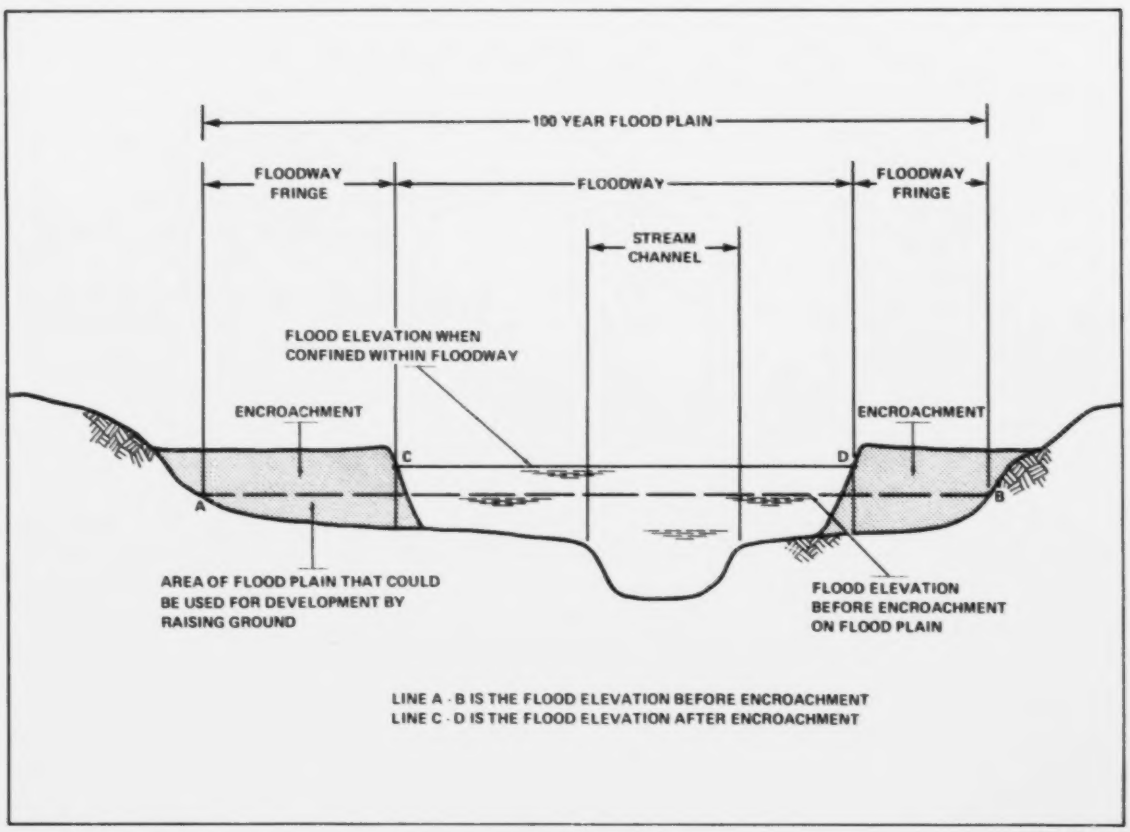

FIGURE 3

FLOODWAY SCHEMATIC

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Okanogan River								
A	77.31	390	4530	0.9	917.6	917.6	918.6	1.0
B	77.75	320	2860	1.5	917.8	917.8	918.7	0.9
C	78.03	155	1985	2.1	917.9	917.9	918.9	1.0
D	78.41	645	8080	0.5	918.2	918.2	919.1	0.9

[1]Miles Above Mouth

[2]This Width is Entirely Outside Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF OROVILLE, WA
(OKANOGAN CO.)

FLOODWAY DATA

OKANOGAN RIVER

BEST DOCUMENT AVAILABLE

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the Town of Oroville.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This differences does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

One reach meeting the above criteria was required for the flooding source affecting the Town of Oroville. This reach was on the Okanogan River. The location of the reach is shown on the Flood Profiles.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Town of Oroville was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zone A7	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones assigned according to FHFs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water-control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data", summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Oroville is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

The Seattle Distr[illegible]. COE, completed a 100-year flood analysis for the Similkameen R[illegible] in 1973, using the Seattle District computer program (Reference 11). This area is now protected by the Smilkameen River levee and does not agree with that analysis.

The Federal Emergency Management Agency published a Special Flood Hazard Boundary Map for the City of Oroville (Reference 15). This Flood Insurance Study uses more detailed methods of study; therefore, they do not agree.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Okanogan River Reach 1	0001	-3.7	-1.2	+2.6	035	A7	918

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF OROVILLE, WA
(OKANOGAN CO.)

FLOOD INSURANCE ZONE DATA

OKANOGAN RIVER

BEST DOCUMENT AVAILABLE

The Okanogan River was not studied in detail by the COE, although it was surveyed. The COE had recorded high water marks along the river, resulting from the 1972 flood (Reference 11). These high water marks were used for calibration of the computer run used for the hydraulic analyses.

The contiguous Flood Insurance Study for Okanogan County, Washington (reference 16), completed by CH_2M Hill, Inc., was coordinated with this study.

This report supercedes the previous Flood Insurance Study (Reference 17) and should be considered authoritative for purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Chief, Natural and Technological Hazards Division, Federal Emergency Management Agency, Federal Regional Center, 130 228th Street, S.W., Bethell, Washington 98011.

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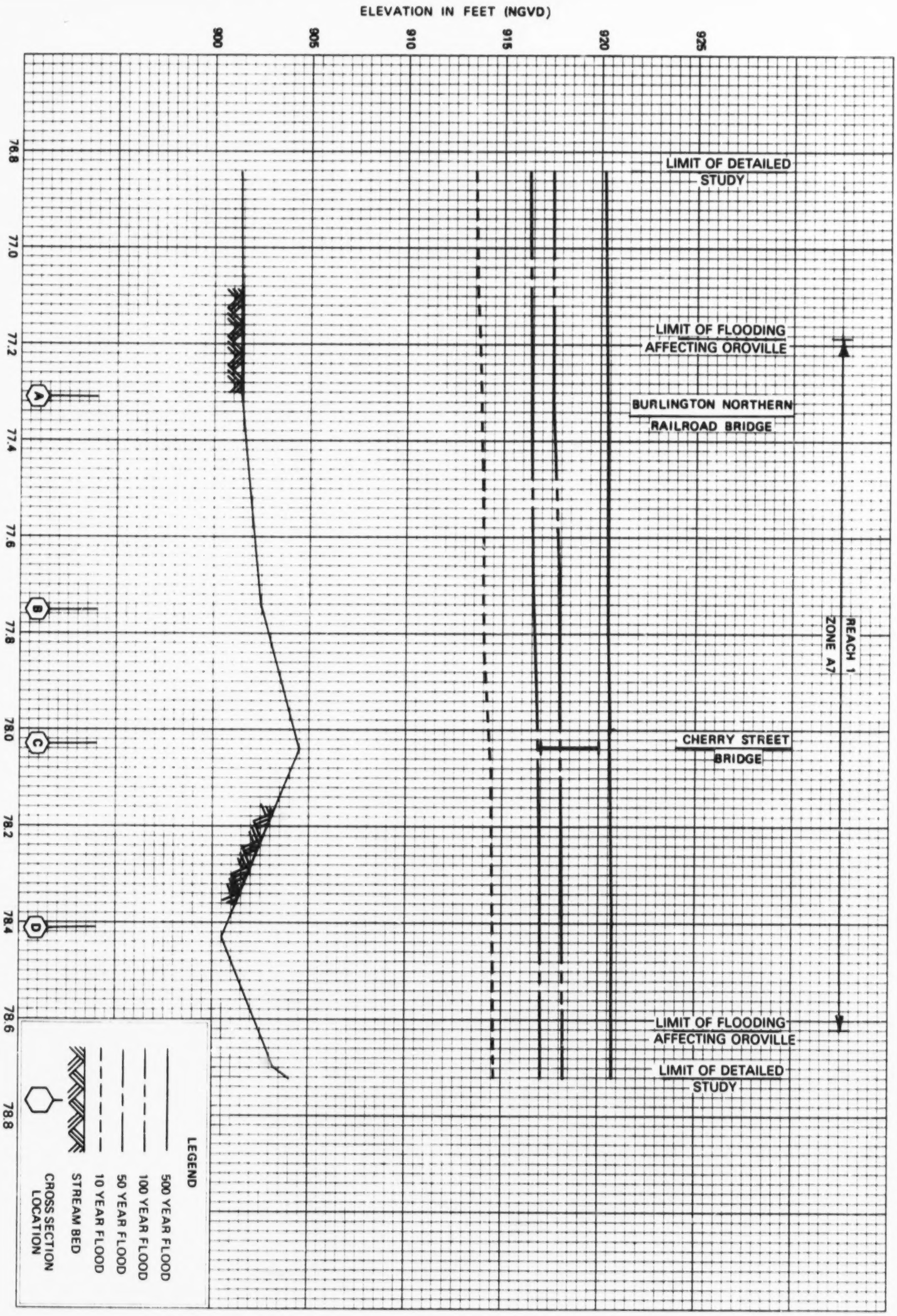

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